

A New Species of *Pieris* (Ericaceae) from Amamioshima, Ryukyu Islands, Japan

HIROAKI SETOGUCHI^{1*} AND YOSHIYUKI MAEDA²

¹Department of Biology, Graduate School of Human and Environmental Studies, Kyoto University, Yoshida Nihonmatsu-cho, Sakyo-ku, Kyoto 606-8501, Japan. *seto@botany.mbox.media.kyoto-u.ac.jp (author for correspondence); ²Hookaen Nursery, Tean 118, Setouchi-cho, Oshima-gun, Kagoshima 894-1530, Japan

A new species of *Pieris* (Ericaceae), *P. amamioshimensis* Setoguchi & Y. Maeda, from Amamioshima, Ryukyu Islands, Japan, is described and illustrated. *Pieris amamioshimensis* is similar to *P. koidzumiana* from Okinawa Island, but differs in having lanceolate–ob lanceolate leaves and larger corollas.

Key words: Amamioshima, Ericaceae, *Pieris*, *Pieris amamioshimensis*, Ryukyu Islands

The genus *Pieris* (Ericaceae) is composed of small, warm to cool temperate evergreen trees and shrubs that tend to grow in forests and on rocky mountains and valleys. The genus comprises at least seven species (Judd 1982, Mabberley 1997), or perhaps more (Yamazaki 1989, 1993), with a disjunct distribution pattern in the Sino-Japanese region and in eastern North America. In eastern Asia, the genus ranges from the Himalaya to mainland Japan via the Ryukyu Islands arc (Yakushima, Amamioshima, and Okinawa Islands) and Taiwan.

Ohwi (1930) identified the Okinawan species as *P. koidzumiana* Ohwi, based on its larger flowers and more linear leaves than *Pieris* from the Japanese mainland. *Pieris koidzumiana* is endemic to the banks of the Fuku River, Okinawa, and its linear (stenophyllus) leaf structure is considered a rheophytic adaptation for resisting strongly flowing water (van Steenis 1981). The species has also been treated as a subspecies of *P. japonica*, *P. japonica* var. *koidzumiana* Masam. (Masamune 1955) and included in *P. japonica* without formal recognition at any rank (Walker

1976, Judd 1982).

In 1963, a plant of *Pieris japonica* found on a ridge between the summits of Mt. Yuwan and Mt. Jiwa on Amamioshima was identified as being the same as the Okinawan plants, because of the larger flowers. It was later raised to the rank of subspecies (subsp. *koidzumiana* (Ohwi) Hatus.) by Hatusima (1969). The occurrence of *Pieris* on Amamioshima has been neglected in later treatments (Walker 1976, Judd 1982, Yamazaki 1989, 1993), and plants of *Pieris* from Okinawa and Amamioshima have not been compared. For conservation management, *Pieris* on both islands have been treated as *P. koidzumiana* Ohwi (Japan Society of Plant Taxonomists 1993, Environment Agency of Japan 2000).

Niihara (2000) compared the floral morphology in individuals of *P. koidzumiana* from Okinawa and Amamioshima with plants of *P. japonica* from Kagoshima Prefecture. That study reported differences in floral morphology between the islands; the corolla of plants from Amamioshima was longer and fatter (unconstricted) than in plants from Okinawa. Setoguchi *et al.* (2006)

examined the floral and leaf morphology of *Pieris* from Amamioshima, Okinawa, Yakushima and Taiwan. Although populations of *P. koidzumiana* on Okinawa and Amamioshima both exhibit relatively large, unconstricted corollas, they differed significantly in terms of absolute size from those of Yakushima and Taiwan. The overall floral morphology of plants of *P. koidzumiana* from Amamioshima and Okinawa also differed significantly, with the corollas of the plants from Amamioshima being longer and wider and more weakly constricted at the orifice of the corolla than those from Okinawa Island (one-way analysis of variance, $p < 0.05$). In addition, *P. koidzumiana* from Okinawa was clearly distinguishable from plants from the other three islands by its substantially narrower leaves. The leaves of *Pieris japonica* var. *yakushimensis* from Yakushima and *P. taiwanensis* from Taiwan were wider and smaller than the leaves of *P. koidzumiana*, and also had smaller and more constricted corollas. The plants of *Pieris* from Amamioshima therefore differ significantly in flower and leaf shape from other insular species of the Ryukyu Islands and Taiwan.

The morphological heterogeneity of *Pieris koidzumiana* on Amamioshima and Okinawa is consistent with the ecological differences between the plants on the two islands. The plants on Okinawa grow on riverbanks and are stenophyllous, suggesting an adaptation to strongly flowing water. Such plants, called rheophytes, can withstand frequent submergence during floods after heavy rains (van Steenis 1981). Conversely, *Pieris* on Amamioshima grows on rocks on mountain ridges and has wider leaf blades.

Molecular phylogenetic studies also suggest that *Pieris* on Okinawa and Amamioshima is paraphyletic. *Pieris koidzumiana* from Okinawa forms a clade with *P. taiwanensis* of Taiwan, whereas plants of *Pieris* from Amamioshima cluster with *P. japonica* var. *yakushimensis* of Yakushima. DNA sequence data differentiate the two insular populations of Amamioshima and Okinawa, with an estimated divergence time of 0.2 MYA, corresponding to the mid-Pleistocene (Setoguchi *et al.* 2008).

Both morphological and DNA evidence for distinguishing the taxa of *Pieris* on Amamioshima from other insular species (including *P. koidzumiana* on Okinawa) has been accumulating. We therefore describe as a new species the plants of *Pieris* from the mountain ridge between Mt. Yuwan and Mt. Jiwa on Amamioshima, Ryukyu Islands.

***Pieris amamioshimensis* Setoguchi & Y. Maeda, sp. nov. (Fig. 1)**

Affinis *Pieridi koidzumianae* Ohwi, sed corolla leviter majore 9.9–11.7 mm longa, 7.1–8.5 mm lata, et foliis lanceolatis vel oblanceolatis diversa.

Frutex, ramis glabris. Folia coriacea petiolata lanceolata vel oblanceolata 6–7.8 cm longa, 1.8–2.4 cm lata, basi cuneata, margine prope apicem tantum crenato-serrata vel integra, apice obtusiuscula vel acuta, utrinque glabra. Calyx 5-lobatus, lobis ca. 4 mm longis, 2 mm latis, ovatis, utrinque glabris. Corolla campanulata 9.9–11.7 mm longa, 7.1–8.5 mm lata, alba, 5-lobata, lobis reflexis rotundatis 2 mm longis. Stamina 10, filamentis ca. 4 mm longis barbatis ad apicem glabra, antheris oblongis ca. 2 mm longis, dorsaliter ad basin 2-calcaratis, calcaribus ca. 1.3 mm longis. Ovarium globosum, 1.5 mm diametro, apice 5-loculare. Stylus columnaris ca. 6 mm longus, basi intra ovarium intrusus, stigmate truncato. Capsula late globosa 4 mm longa, 6 mm lata. Semina scabiiformia, utrinque alata, rubescens, cum alis ca. 2.5 mm longa, 0.4 mm lata.

Typus. JAPAN. Kagoshima Pref., Amamioshima, summit of Jiwa-dake, alt. 680 m, 27 March 1965, S. Sako 5318 (holo- KAG [fl.]; iso- KAG [fl.], 2 sheets).

Small trees or shrubs. Branchlets glabrous. Leaves coriaceous, petiolate; blade lanceolate to oblanceolate, 6–7.8 × 1.8–2.4 cm, base cuneate, margin crenate-serrate with few teeth near apex, apex obtuse to acute, both surfaces glabrous. Inflorescence paniculate. Flowers February to March; calyx lobes 5, ca. 4 mm long, 2 mm wide, both surfaces glabrous; corolla campanulate, 9.9–11.7 mm long, 7.1–8.5 mm wide, yellowish, lobes 5, rounded, 2 mm long, reflexed; stamens 10, filaments ca. 4 mm long, barbate, apex glabrous, anthers oblong, ca. 2 mm long; appendages at base on dorsal surface of anthers 2, calcariferous, appendage ca. 1.3 mm long; ovary globose, 1.5 mm in diam., locules 5; style columnar, ca. 6 mm long, base inserted toward ovary, stigma truncate. Fruits capsules, globose, 4 mm tall, 6 mm

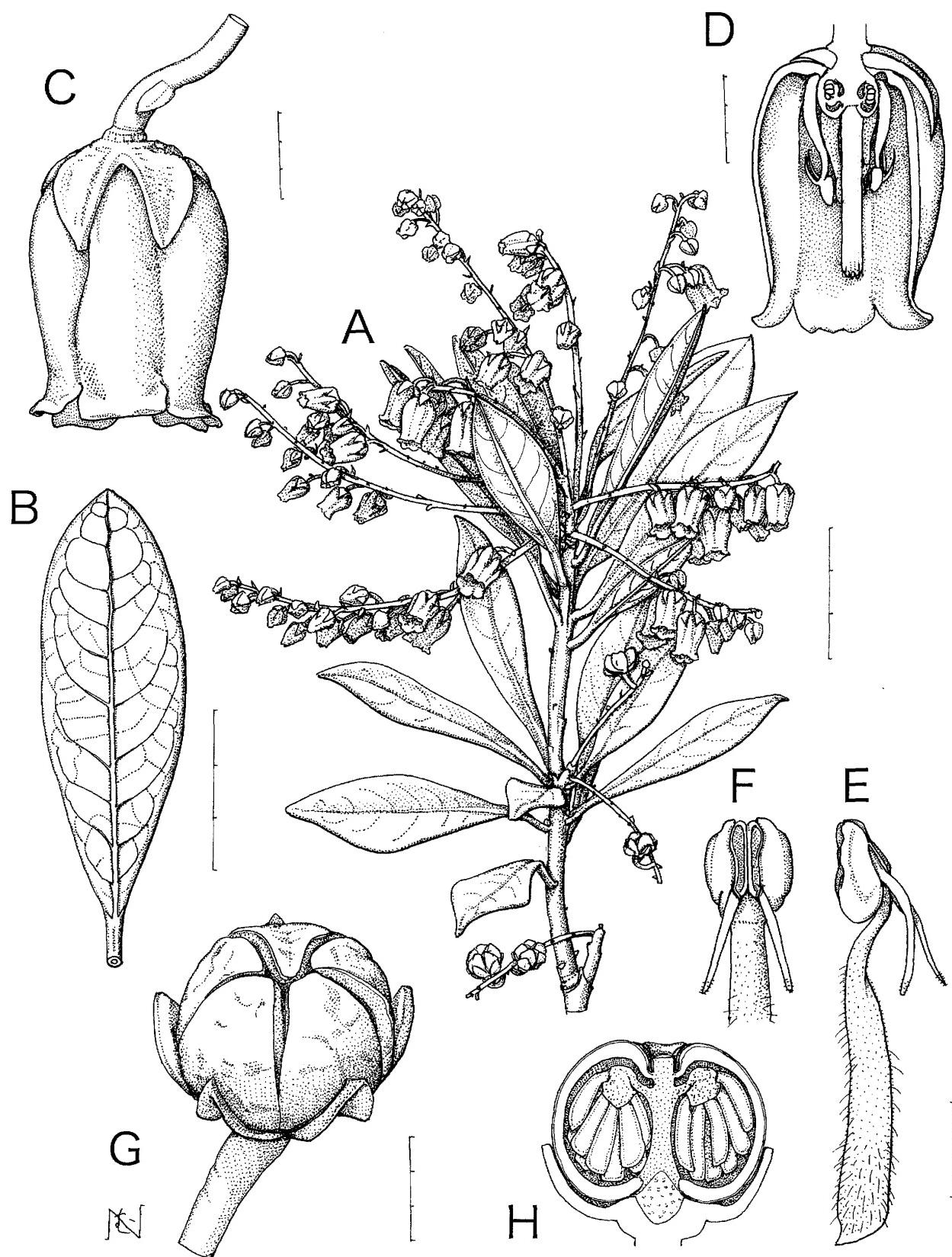


FIG. 1. *Pieris amamiosimensis* Setoguchi & Y. Maeda. A: branch with flowers and fruits. B: adaxial view of leaf. C: flower. D: flower with half of corolla removed. E: lateral view of stamen. F: abaxial view of anther and appendages. G: fruit. H: longitudinal section of fruit. Scale bars = 3 cm (A, B), 3 mm (C, D, G, H), 1 mm (E, F).

thick. Seeds scobiform, winged, wing, ca. 2.5 mm long, 0.4 mm wide, reddish.

Japanese name: Amami-asebi

Distribution. Known only from Mts. Yuwan and Jiwa, south Amamioshima, Ryukyu Islands, Japan.

Habitat. Evergreen forests near summits, 600–690 m altitude; usually grown on rocks.

Note. There are three specimens of *S. Sako 5318* in KAG, and we have selected one for holotype and remainders for isotypes. The characteristic large corollas of *Pieris amamioshimensis* increase its horticultural value. Many individuals have been illegally collected in the wild, leaving only a few individuals on steep cliffs. *Pieris amamioshimensis* has been designated a vulnerable species (Category IA; Environment Agency of Japan 2000) on the basis of IUCN criteria.

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